Claims

1. A rotating electric machine having a magnetic circuit which in one of the parts of a rotor (5) and a stator (2) of the machine comprises an element (1) having a slot (8) for a winding having layers (14, 16) of cables (9) extending substantially axially and arranged substantially radially outside each other, said cables (10) comprising an inner conductor comprising a plurality of strands (13) and an insulation (11) externally thereof, ***characterized*** in that a larger share of the strands of the cables closest to the other part of the rotor and the stator are electrically insulated with respect to each other than of the cables most far away from the other part.

2. A rotating electric machine according to claim 1, ***characterized*** in that substantially all strands (13) are electrically insulated with respect to each other in the cable layer (14) closest to said other part.

3. A rotating electric machine according to claim 1 or 2, ***characterized*** in that substantially none of the strands (13) are electrically insulated with respect to the other strands in the cable layer (16) located most far away from said other part (5).

4. A rotating electric machine according to any of claims 1 to 3, ***characterized*** in that the share of strands electrically insulated with respect to the rest of the strands (13) of the cable (9) decreases in the direction away from said other part (5).

5. A rotating electric machine according to claim 4, ***characterized*** in that said decrease takes place for each cable layer in the direction away from said other part (5).

6. A rotating electric machine according to claim 4, ***characterized*** in that said decrease takes place in steps after two or more cable layers having the same share of strands (13) electrically

insulated with respect to each other in the direction away from said other part (5).

7. A rotating electric machine according to any of claims 1-6, ***characterized*** in that said element (1) having slots (8) is arranged in the stator (2) of the machine.

8. A rotating electric machine according to any of claims 1-7, ***characterized*** in that the magnetic circuit is for high voltage and the potential of the cable layers increases in the direction away from said other part (5), and that the thickness of said insulation (11) of the cables (9) increases continuously or stepwise in the direction away from said other part.

9. A rotating electric machine according to any of claims 1-8, ***characterized*** in that the electrical insulation of the strands (13) with respect to each other is obtained by providing the respective insulated strand with a thin electrically insulating envelope (15) surrounding the strand.

10. A rotating electric machine according to claim 9, ***characterized*** in that the insulating envelope (15) is formed by an insulating lacquer.

11. A rotating electric machine according to claim 1-8, ***characterized*** in that the electrical insulation of the strand (13) with respect to each other is obtained by making such electrically insulated strands of aluminium, the surface of which is allowed to oxidate for forming an aluminium oxide layer surrounding the strand.

12. A rotating electric machine according to claim 11, ***characterized*** in that the electrically uninsulated strands (13) are made of copper and the electrically insulated strands (13) are made of aluminium.

13. A rotating electric machine according to any of claims 1-12, ***characterized*** in that at least the cable (9) of the layer (14) closest to said other part (5) has all strands (13) made of aluminium and at least the cable of the layer (16) most far away from said other part has all strands (13) made of copper.

14. A rotating electric machine according to any of claims 1-13, ***characterized*** in that said winding is at least partially formed by a cable (9) in the form of a flexible electric conductor (10) with an envelope (11) able to confine the electric field generated around the conductor.

15. A rotating electric machine according to claim 14, in which the envelope comprises an insulation system, ***characterized*** in that the insulation system comprises an insulation formed by a solid insulation material (17) and outside thereof an outer layer (18) having an electrical conductivity which is higher than the electrical conductivity of the insulation so that the outer layer may through connection to ground or otherwise comparatively low potential be able to on one hand operate for equalizing potential and on the other substantially enclose the electric field generated as a consequence of said electric conductor (10) inwardly of the outer layer.

16. An electric machine according to claim 14 or 15, in which the envelope comprises an insulation system, ***characterized*** in that the insulation system comprises an insulation (17) formed by a solid insulation material and an inner layer (19) interiorly thereof, that said at least one electric conductor is arranged interiorly of the inner layer and that the inner layer has an electrical conductivity being lower than the electrical conductivity of the electric conductor but sufficient for making the inner layer to operate to equalize potential and thereby to equalize the electric field outside the inner layer.

17. An electric machine according to claim 15 or 16, ***characterized*** in that the inner (19) and the outer (18) layers and the solid insulation (17) have substantially equal thermal properties.

18. An electric machine according to any of claims 15-17, ***characterized*** in that the inner (19) and/or the outer (18) layer comprise a semiconductor material.

19. An electric machine according to any of claims 15-18, ***characterized*** in that the inner layer (19) and/or the outer layer (18) have a resistivity in the range $10^{-6}\Omega$cm – 100 kΩcm, suitably 10^{-3} - 1000Ωcm, preferably 1-500Ωcm.

20. An electric machine according to any of claims 15-19, ***characterized*** in that the inner layer (19) and/or the outer layer (18) has a resistance, which per length meter of the conductor/insulation system is in the range 50$\mu\Omega$ - 5 MΩ.

21. An electric machine according to any of claims 15-20, ***characterized*** in that the solid insulation (17) and the inner layer (19) and/or the outer layer (18) are formed by polymeric material.

22. An electric machine according to any of claims 15-21, ***characterized*** in that the inner layer (19) and/or the outer layer (18) and the solid insulation (17) are rigidly connected to each other over substantially the entire interface to ensure adherence also upon flexing and temperature change.

23. An electric machine according to any of claims 15-22, ***characterized*** in that the solid insulation and the inner layer (19) and/or the outer layer (18) are formed by materials having a high elasticity to maintain mutual adherence on strains during operation.

24. An electric machine according to claim 23, ***characterized*** in that the solid insulation (17) and the inner layer (19) and/or the outer layer (18) are of materials having substantially equal E-modulus.

25. An electric machine according to any of claims 15-24, ***characterized*** in that the inner layer (19) and/or the outer layer (18) and the solid insulation (17) are formed by materials having substantially equal coefficients of thermal expansion.

26. An electric machine according to any of claims 15-25, ***characterized*** in that the inner layer (19) is in electric contact with the at least one electric conductor (10).

27. An electric machine according to claim 26, ***characterized*** in that said at least one electric conductor (10) comprises a number of strands (13) and that at least one strand of the electric conductor is at least in part uninsulated and arranged in electric contact with the inner layer.

28. An electric machine according to any of claims 15-27, ***characterized*** in that the conductor and its insulation system are designed for high voltage, suitably over 10 kV, in particular over 36 kV and preferably over 72,5 kV.

29. An electric machine according to any of the preceding claims, ***characterized*** in that it is adapted to be connected through the windings to a high voltage, suitably over 10 kV, in particular over 36 kV and preferably over 72,5 kV.